

EXPERIMENTAL 234 h 26
OBSERVATIONS

ON THE

Water of the Mineral Spring near *Issington* ;
commonly called

New Tunbridge Wells : *Saunders' Wells*

TENDING,

As well to explain and illustrate the general Nature of Chalybeat Waters ; as to demonstrate, from an obvious Comparison of its qualities with those of the *Spa* and *Tunbridge* Waters, made by an accurate Examination, that it is absolutely of the same Species with them, but greatly preferable, on Account of that advantageous Reduction of the Quantity it admits of, from its higher Impregnation, and the consequent Increase of its Efficacy.

To which is subjoined,

An Account of its Medicinal Virtues and Use ;
and of the most adviseable Methods of
Drinking it in each Kind of Case.

L O N D O N :

Printed for J. ROBINSON, at the *Golden Lion*,
in *Ludgate-street*. 1751. [Pr. 6d.]

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EXPERIMENTAL

OBSERVATIONS

ON THE

Water of the Mineral Spring near Kingston;
commonly called

New Tunbridge Wells:

TENDING

As well to explain and illustrate the general
Nature of Chalybeate Waters; as to demon-
strate, from an obvious Comparison of its
Quantities with those of the Spa and Tun-
bridge Waters, made by an accurate Ex-
amination, that it is absolutely of the same
Species with them, but greatly preferable;
on Account of that advantage, Reduction
of the Quantity is advised, and the higher
Impregnation, and the consequent Increase
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To which is subjoined,

An Account of its Medicinal Virtues and Use;
and of the most advisable Methods of
Drinking it in each Kind of Case.

L O N D O N :

Printed for J. Robinson, at the Golden Lion,
in St. Dunstons Church-yard. 1751.

P R E F A C E.

AFTER the sanction, which an universal and long continued practice has given to the medicinal use of Mineral Waters, (especially those of the Chalybeat kind;) and that copious experience, which has prevailed on the most able Physicians to acknowledge the efficacy of them; it would be a needless labour to go about to prove their general excellence. That they may be accounted one of the most valuable gifts, which providence has bestowed on us, will be denied by few; as scarcely any are ignorant, that, by their means, we may frequently obtain an easy relief in chronic distempers, the greatest of those evils to which the present nature of our Being renders us liable; and this, sometimes, even when the force of medicines, hazardously violent, has been tried in vain. But if it be unnecessary to point out and demonstrate the already well-known benefits, that may accrue from judiciously drinking mineral waters; it may notwithstanding be of important service, to give a light into the method of distinguishing the genuineness of any, that are offered to the public. Nor less so, to inform the numerous inhabitants of London, that their neighbourhood affords a chalybeat spring, equal, if not superior, to any other with which the world has been hitherto made acquainted; and to add such proof of the truth of the fact, from Observations and Experiments on the properties of water, (comprehensible to any of moderate understanding) shewing its specific

affinity (or sameness of kind) with others the most esteemed; as together with the manifold instances of its actual virtue, in the cure of various diseases, that will on proper inquiry be found to have occurred, may satisfy every doubt, and remove all scruples, which shall on any account have arisen concerning it. The diffusive communication of this truth, may probably be the means of a very essential good. It may furnish a happy opportunity to many, whose ill or uncertain state of health calls for the administration of such remedies, of procuring that much wanted assistance, they might not otherwise imagine to be within the compass of their reach. It may enable those, whom the fatigue or expence of journies may deter or hinder, the urgency of business prevent, or an attachment to their families withhold, from seeking them at a greater distance, to avoid the dangerous or fatal omission of their use, by finding themselves provided with one near at hand, on which they may assuredly rely; for that the waters of the Mineral Spring near Inlington, commonly called New Tunbridge Wells, may be justly deemed so, none, who will take the trouble of examining the following contents, can have room to question.

It is not, however, that this medicinal treasure has, till the present time, lain totally hid from those, to whom it could afford such material advantages. A great resort, for many years, of invalids of all ranks, and labouring under a diversity of maladies, evinces that just notion the public formerly entertained of these waters; and the attendance, as well of some people of condition, as others, by the advice of persons of unquestioned merit in the faculty, shews likewise, there are not at present wanting those who are sensible of their real value.

The P R E F A C E.

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lue. But nevertheless a neglect of attention, arising from that caprice of mankind so common in matters of this nature; and certain prejudices against them, unfairly propagated, to answer selfish and sinister ends, by persons, some of them of note, in the several branches of the practice of medicine; have in some measure diminished that reputation they have for many years held; and even greatly contracted the knowledge of the public with respect to every thing concerning them: whence doubtless many have been deprived of the effectual aid against the rage of calamitous or mortal diseases, they might otherwise have happily received from them; and that without the torment of those tiresome and nauseous loads of medicine, with which patients under such circumstances are too often persecuted.

As the belief of the salutiferous powers of chalybeate mineral waters has been too well confirmed, by a long course of experience, to be easily shaken, the method taken to decry the Illington spring, has been by endeavouring rather to disparage the particular merits of it, than to depreciate the kind: and indeed it suited much better with the views of those, who have been most active in cultivating prepossessions against it, to arraign the pretensions of its yielding genuine mineral waters, than to deny the virtues of such when real; their final intention being, not to discourage the drinking of mineral waters in general, but only to give a preference to those, in the vogue of which, they might, from some private connection, find their own account. It is to be feared, that these, however mean, are the true motives, which have induced some eminent Physicians, as well as others, to declare positively,

positively, that the waters of this well are artificially medicated: an assertion, which when duly reflected on with the least knowledge of the relative facts, cannot fail to appear as idle as wicked. But how persons, who have a distinguished character to support, and depend on the confidence of the world in their probity and skill, dare venture to advance a falsity so glaring on the first view to some, and so easily confuted, by the least explication, with all, I own, I am entirely at a loss to account. If they really inquired into the circumstances of the case, or attempted by any actual trials of the water to assure themselves of the truth, it must be thought surprizing, that their ignorance of the subject should be so great, as to make them fall into such an enormous error; and yet more so, that, being no better qualified to judge of the matter, they should risque the detection of their want of knowledge, by avowing an opinion formed on a foundation thus defective. Or if, on the other hand, they wantonly alledged the thing, without any grounds at all of previous information, or from having taken up the notion on the credit only of some vague report, what strange folly, as well as injustice, do they not seem guilty of, to venture to stake their judgement and veracity together, on the vain supposition of a point, that, taken in any rational light whatever, must seem improbable: nor can ever become a just article of belief, much less a fit one of peremptory affirmation, but through the force of some very authentic testimony of the fact itself, or of a clear induction drawn from some experimental research, conducted on obvious and indisputable principles. But however incredible the affair may seem, it is as certain,

tain, that reports of this kind have been industriously spread, and even by some Physicians of note, as well as other persons, to the great detriment both of the public and the proprietor of these Wells, as that all such are absolutely false in every degree.

It is therefore peculiarly seasonable at this time, to give a more succinct and full account of the Islington waters, than has been hitherto laid before the public, by which, (the correspondence of their qualities with those of other Chalybeat springs of the greatest repute, being therein particularly made appear,) their absolute, as well as comparative goodness, may be clearly distinguished; and those prepossessions against them removed, that may prevent the public from reaping those benefits they might otherwise afford. And it may not be improper, to subjoin some such remarks on the general nature of Chalybeat waters, whether natural or fictitious, as may shew even the impossibility of giving to any compounded by art the characteristics, which these in question are found to bear. But besides the good, that may be conferred on the people of London and its neighbourhood, by imparting to them just notions of the peculiar excellence of the Islington waters, I have endeavoured to afford another to the world in general, by displaying, in the most clear light the conciseness requisite in this small tract would admit, some truths regarding all Chalybeat waters; which, though hitherto unknown or disregarded, are yet well worthy, either on the motives of curiosity or use, of the strictest attention: as they both furnish agreeable matter of philosophic speculation, and illustrate some very interesting points of practice. And though, in this double view, I may possibly have introduced some things belonging

belonging to a branch of science pursued by few, that may not be perfectly understood by the generality of those, for whom the perusal of this work is designed, yet as I have been careful to introduce them in such a manner, as may prevent their throwing any perplexity on the rest, I hope I may be excused for it by those, to whom therefore their insertion or omission is alike indifferent.

The Spa and Tunbridge waters, holding the first rank among those at present in esteem, which owe their medicinal virtues solely to a Chalybeat impregnation, I thought it proper in my examination of the Islington water, to have a particular regard to its affinity with them: and I have accordingly made the same trials of them all, by the experiments that gave foundation to the following Observations, in which I shall faithfully note what the result presented in relation to each. And this I have done, imagining it would be a more satisfactory method of manifesting the genuineness of the Islington waters, to those who are not conversant with subjects of this kind, to shew they are the same with the others of which the merits are undisputed, than to attempt to demonstrate it altogether on abstract principles; in respect to which, the want of their being previously understood, would render the reasonings drawn from them of little force with many. But to those who are unaccustomed to speculative disquisitions, there are nevertheless few things so abstruse in what I have advanced, as to prevent their comprehending them sufficiently to render nothing more wanting to give them their due effect, than that attention which arises from a taste for the subject.



EXPERIMENTAL
OBSERVATIONS
ON THE

Water of the Mineral Spring near *Islington*.

THE mineral spring, commonly called *New Tunbridge Wells*, (from its being of a similar nature to that of *Tunbridge* in *Kent*) affords, as I shall make it appear below, a true *native* Chalybeat water of the *simple* kind; being totally free from any of those cathartic salts, with which the *Scarborough*, and many other mineral waters are, besides the steel, impregnate; and which render them therefore of a compound, and consequently different nature, from the *simple*, as well in their medicinal operation, as in those properties which are cognizable by experiments. The principal of the *simple* Chalybeat Waters, in respect to the present practice, are those of the *Spa* and *Tunbridge*; of which the strict affinity in all their discoverable qualities, with the water of the *Islington* spring, is one chief medium I shall use in demonstrating this to be truly of that kind, the medicinal virtues whereof are so well confirmed by a long and general experience: and this view will, in the conduct of the following observations, be constantly preserved.

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The time when the *Islington* waters were first known as a remedy, is not to be certainly collected from any information I have hitherto met with: for the first written notice I have found taken of them, is in a treatise of Mr. *Boyle's*, published in 1684, wherein, amongst those of other mineral waters, he gives their specific gravity; and from the circumstances of the mention he makes of them, it may be gathered, that they had, before the time he wrote, occasioned the place to be the seat of some public diversions; and that there were then open three several heads to this spring; which, according to the expression whereby he distinguishes them, were, one near the *music-house*, which I take to be that at present used; another *in the cellar*; and a third *in the vault with steps*; which two last have been for many years filled up: that which has been kept in use having been found to be preferable, as appears by this account of them; as they vary from common water in double the proportion to the other. That the place had * been in much the same condition long before his time, may be concluded from the pictures, furniture, and other particulars found in the long room, which carry marks of a date, at least as early as the reign of queen *Elizabeth*. And this I think is one of the circumstances, that reflect an absurdity on those, who are fond of the opinion of their being counterfeited; it being scarcely possible that a fraud, which might at any time be so easily detected by experimental proofs, should be so pertinaciously kept up, and imposed upon the public for so many years.

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* It is obvious that this water was in public use, as a medicine, long before the very notion of fictitious mineral waters had been formed in *England*: for in the reign of king *Charles II.* sir *William Jennings*, obtained a patent for the sole making of such waters, on the merits of having been the *first* inventor of them.

The most distinguishing and peculiar quality in the *Islington* waters, is their specific gravity, (or comparative weight with others) which according to the account given by Mr. Boyle (*) and verified by an examination lately made) is less than that of common water in the proportion, three ounces, four drams, and thirty-six grains, bear to three ounces, four drams, and forty-three grains; that is to say, the *Islington* water is lighter than common water, by seven in one thousand seven hundred and twenty-three. The means made use of by Mr. Boyle, for discovering this difference, was by filling a glass of a proper form, to an exact height, with each kind of water, and then weighing it; on which trial of these, along with the mineral waters of several more *springs* †, they were found to hold the proportion here given.

Among

* I made a trial of the specific gravity of this water, with one of the best kind of Hydrometers, or *Water-poses*, now in use; but, indeed without expectation of finding the state of the water such at present, after a rainy season of more than four months duration, as would suffer it to correspond in absolute fact with Mr. Boyle's account. It is constantly apparent, to those who have an opportunity of tasting it at such times, that the peculiar flavour of the water is abated, even by common rains; and certainly the extreme wetness of the present season, must have had proportionable effects, and greatly diminished its specific qualities. There was, however, enough difference found betwixt its weight and that of common water, to confirm the belief of a matter delivered on an authority so respectable; and in a case so simple and obvious, that nothing but a failure of the voucher's veracity could give occasion to the falsehood.

† The waters Mr. Boyle examined by this method, and their respective weights, were as follows:

		oz.	dr.	gr.
Common water was found to weigh	—	3	4	43
Common water distill'd	—	3	4	41
<i>Aspen</i> water	—	3	4	48½
	B 2			<i>Epsom</i>

Among the others, it appeared, that the *Tunbridge* water was lighter than common water, by 5 in 1723; and the *Spa* water by 3; and consequently the first, than the *Islington* water by 2, and the latter by 4: the rest which he tried being all of a saline nature, though some of them participating also of a Chalybeat impregnation, proved heavier in various degrees than common water.

As this remarkable * accident is found, in a greater or less proportion, to attend all *native* Chalybeat waters,

			oz.	dr.	gr.
<i>Epsom</i> water	_____	_____	3	4	51
<i>Dulledge</i> water	_____	_____	3	4	54
<i>Stratton</i> water	_____	_____	3	4	55
<i>Barnet</i> water	_____	_____	3	4	52
<i>North Hall</i> water	_____	_____	3	4	50
The <i>German Spa</i> -water	_____	_____	3	4	40
<i>Tunbridge</i> water	_____	_____	3	4	38
<i>Islington</i> water from the music-house	_____	_____	3	4	36
<i>Islington</i> water from the vault with steps	_____	_____	3	4	39
<i>Islington</i> water from the cellar	_____	_____	3	4	39

* This appearance is, perhaps, as remarkable, and seemingly contradictory to the analogic laws of the subject, as any whatever that nature presents: and though yet unattended to, affords as ample matter of curiosity. It being a paradox well deserving the pains of a philosophic solution, that water impregnated with so heavy a body as iron, should notwithstanding be rendered thence lighter than in its simple state, and in such a degree, that the defect is in a multiple proportion to the weight of iron any given quantity contains; but, however irreconcilable to the general analogy, or difficult to the conception, it may be found on an exterior view, a reason for this seeming breach may be discovered in a closer research into the specific properties of bodies, and the effects of their conjunct action. An acquaintance with the general powers and laws of co-operation of those bodies, the experiments of chemistry teach us to regard as elementary, is indeed necessary to a thorough comprehension of this seeming deviation; but I shall have occasion in the sequel of this essay, to touch on some of the leading

ters, that are not of a *compound* kind, and them alone; and as it can be produced only by nature, there being, for reasons we shall have occasion to explain hereafter, no practicable method of producing it by art; it affords an infallible mark of the genuineness of those in which it is found. And as the proportion of the variation from common water, in this point, in the water of each spring, must be supposed correspondent to that of the medicating substance, with which such is charged, it gives likewise the means of determining the quantity of the impregnation: whence a double end may be obtained by this method of trial of Chalybeat waters; "the proof of their being of the right species, and the measure of the comparative strength, or degree of medicinal power they bear to each other." This being granted, it amounts to a full demonstration, that the *Islington* water, which has this quality in a degree beyond any other hitherto known, must be of the genuine and true kind: and also, that as it exceeds the others in this point, it must be allowed to excel them; its medicinal efficacy being thence, by a necessary inference, argued to be superior. I do not, however, mean, that it is indued with any distinct virtues or powers, which they are totally destitute of; but that possessing the same in a greater degree, a less quantity will suffice to work an equal effect. An advantage of the utmost importance in many cases, the great load of water, taken in such a proportion as carries enough of the medicinal matter to constitute a proper dose, being frequently disagreeable to the bowels; and in some instances of very injurious consequences. And indeed this is so much the case in mineral waters which operate by purging, that it is a reasonable question, Whether it be not always better to take an artificial solution of cathartic salts, than to swallow such monstrous draughts

ing principles, in a manner, that may possibly yield some satisfactory notions concerning it, even to such as are strangers to these subjects.

draughts as are required of this kind, to produce the intended effect. This objection does not however avail in the same high degree, even in the case of the weaker Chalybeat waters; but is intirely obviated, in regard to that of the *Islington* spring, by its extraordinary strength; for the fit quantity to be taken is so moderate, as not to subject those who drink it, in the least, to this inconvenience: and indeed it is very happy, that the fact is so, for those who have occasion for this kind of remedy; as no substitution of an artificial preparation of steel can be made in the stead of the true mineral Chalybeat water, either in a fictitious Chalybeat water or any other form, with adequate effects; as I shall below take an opportunity of explicitly showing.

The taste of the *Islington* water is the same with that of all other things which receive their flavour from iron; but it is only in a small degree *styptic* or *austere*. It resembles exactly, when diluted with proper quantities of pure water, to reduce it to an equal strength, the *Spa* and *Tunbridge* waters: and even in this point there is a sensible difference, though such as may, perhaps, escape those who are not beforehand apprized of it, betwixt the *natural* Chalybeat water, and any *artificial* solutions of steel; in all which, an acid must necessarily be used, and give that roughness and acrimony which constitutes this difference. This variation of their taste, might therefore alone be a sufficient means of distinguishing the *fictitious* kind, to any of a nice palate, and accustomed to the flavour of the *natural*.

The *Islington* water being commixt with brandy, or an infusion of galls, green tea, &c. turns them instantly black; but this method of trial yields no other proof, than that those which exhibit this appearance, are really Chalybeat waters of some kind or other; but whether formed by *nature* or compounded by *art*, cannot be thence inferred: it being an inseparable property of all water impregnated with iron, unless abounding with
some

some acid, to produce this effect. To any, however, who want an universal criterion for distinguishing Chalybeat waters, even though charged with iron only in the minutest degree, this experiment, made with a solution of galls, will supply one; provided care be taken previously to examine, that the water in question contain no redundant acid; and that if such be discovered, it be duly neutralized by the addition of some alkali.

The *Islington* water being suffered to exhale in the air, or being evaporated to dryness by heat, an earthy ferruginous powder is left behind; which will retain its solid form, and remain undissolved, though any fresh quantities of pure water be added to it; nor when the mixture has stood at rest till the earthy matter be perfectly settled, will the clear part of the fluid, if poured off, be found to have contracted either the flavour, or any of the other peculiar qualities of the original water, or at least but in a very small degree. The same consequence will result on treating in the same manner, the *Tunbridge, Spa*, or indeed any other *natural* Chalybeat water, except that in those of the *compound* kind, a salt, of which *iron* makes no part, will be found along with the ferruginous earth. This sediment will be copiously deposited by any of these waters, if they be suffered to have free communication with the air, even though the quantity of fluid be very little diminished by exhalation during the time. The proportion of iron, the *Islington* water contains in dry weather, when it is in full perfection, is about 60 grains in two gallons, as I found by weighing the residuum, after a very careful evaporation of that quantity; and what is very extraordinary, this will be found, on computation, to be not equal to one seventh of that weight, of which this water is lighter, when compared with common water.

If *oil of vitriol* diluted in water, be added to the ferruginous sediment, obtained by either of these methods, a strong ebullition will immediately follow, the sediment will be intirely dissolved, and a salt of steel produced.

produced; which may by the common methods be recovered in a crystalline form; or if the mixture be evaporated to dryness, the residuum will be found redissolvable in common water. From whence it is evident, that the steel did not *before* subsist in the form of a *salt*, but was combined with the water by some medium essentially different from the vitriolic acid.

On the commixture of the *Islington* water, with a solution of fixt alkaline or volatile salts, no effervescence appears, nor does any turbidness or precipitation follow. The same holds good of the *Spa*, *Tunbridge*, or any other *natural* Chalybeat water, where the impregnation is *simple*; but on those that are also *charged with cathartic salts*, a *white* turbidness succeeds, which afterwards forms an earthy sediment *.

The *Islington* water being added to a solution of soap, does not in the least coagulate it, nor make any separation, but unites with it in the same friendly manner, as rain or the softest spring water. The *Spa* and *Tunbridge* waters have the same quality.—Being mixt with human bile, either when fresh taken out of the gall bladder, or when kept till it be putrid, no precipitation nor change of colour follows: and if urine be substituted, either in its original or putrified state, instead of the bile, the same will hold true; and in this also, the *Spa* and *Tunbridge* waters agree with it. From hence it appears, that no precipitation or separation of the iron is made, in the bowels *,

* This experiment, is alone, an infallible method of distinguishing the natural Chalybeat waters from those which are artificial; as the latter, on the addition of the alkaline salts, immediately forms a froth and acquires a green foulness: and it is also a proper manner of trial, whether any natural Chalybeat water be of the simple or compound kind; as the first retains its clearness after the admixture of the alkaline salt, while the other gains a white turbidness, according to the quantity of salts it contains.

bowels *, from the natural Chalybeat waters ; since they resist these, which have the greatest power of any of the animal juices in producing such changes:

All these observations † combine to prove, the *Islington* water to be of the true natural Chalybeat kind ; as it differs from those of the *Spa* and *Tunbridge* in nothing whatever, but the *degree* of impregnation ; which, from an obvious reason before alledged, justly intitles it to a pre-eminence over them. They tend likewise to demonstrate, that this water is not produced from any solution of a martial salt ; and give thence another experimental argument, (as I shall distinctly evince below,) that they cannot be the produce of art. There might be many others brought in aid of the same purposes ; but as these amount to a valid proof of the points in question, they fully suffice : and it only now remains, that I should convey such an idea of the general nature of Chalybeat waters, both *artificial* and *natural*, as may intirely display the reasons, which warrant the inferences I draw from these observations ; viz. that the *Islington* water is in all respects, except the degree of impregnation, the same with those of the *Spa* and *Tunbridge* ; and that there is a demonstrable variation, as well in their qualities cognizable by experiment, as their medicinal virtues, betwixt it and any Chalybeat water which can be formed *artificially*.

By Chalybeat waters are understood all those ‡, with
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* On this quality depends the great medicinal excellence of *natural* Chalybeat waters, as I shall below make appear.

† If any person be desirous to repeat any of the experiments referred to by these observations, I doubt not but he will meet with the same indulgence from the proprietor of the wells, which I found.

‡ Some authors have given the name of *Chalybeat* to all mineral waters indiscriminately ; but how absurd it is to call those *steel* waters, which are intirely devoid of steel, as is the case of many, is too obvious to require the proof of arguments.

which iron is so conjoined, as to become a proper and equal part of the fluid. These may be divided into two kinds, *native* and *fictitious* (or *natural* and *artificial*.)—The *native* may be again subdivided into *simple* and *compound*: the *simple* are such, as borrow all their medicinal powers from an impregnation with iron: the *compound* such, as besides the martial or chalybeat matter, contain a quantity of some species of salt, into the composition whereof no iron enters, as the *Scarborough* water and many others; and which therefore differ from the *simple*, as well in their obvious qualities as medicinal effects.

In order to that combination of iron, and the pure aqueous element, which forms a Chalybeat water, the presence, and intermediate action of a third body is always necessary; for when both are in their *simple* state, and freed from all addition, they operate not on each other, nor suffer the least change on their being put together; but the water may be poured off, after the iron has been immersed in it for any length of time, without the least participation of a *Chalybeat* nature.

The substances capable, by their addition, of causing this combination, are alone ACIDS of the several species, and the *phlogistic gas* *: when the effect is wrought by

* By phlogiston is meant, in chemistry, the inflammable principle or sulphureous essence, that, conjoined with other bodies, renders them capable of feeding or supporting fire. Besides the many other properties, with which this chief instrument of nature is indued, it possesses the power of raising specific attractions and cohesions betwixt the parts of bodies of the same kind; and also, under certain conditions, betwixt bodies of a different genius; nor does it appear from any experiments, that a combination of any two kinds can be made without its intermediation; for even where acids act on bodies of an alkaline constitution, the presence of it appears to be, either in a greater or less proportion, necessary, as is seen in the case both
of

by the presence of an acid, a saline body is formed by its union with the iron; which saline body will always remain behind, and become perceptible, on the evaporation of the water: and if reduced to dryness, is capable of a re-dissolution, or new intimate conjunction with fresh water, without the need of further addition: but from the natural Chalybeate water, no salt in the composition of which the least iron is found, can be any ways obtained by mere evaporation, only an earthy sediment is let loose, as the quantity of fluid decreases. The *phlogistic gas* is therefore to be necessarily regarded, as the cause of union here; and the singular diminution of the specific gravity of this kind of waters confirms it to be so: for it is apparent, from a large field of facts, that all bodies, into the constituency of which this substance enters, in a larger degree, are proportionably light, unless where its operation is controlled by the counter-action of acids, which reduces it to the state of a fixed sulphur, wherein its peculiar powers are suspended. All those various bodies, that we call by the names of *oils*, *spirits*, or *essences*, (the kinds of acids falsely so called excepted) are proofs of this; being lighter than water in the same proportion, wherein experience teaches us they abound in phlogiston. Now, though we may be convinced by a copious and unquestionable analogy, that the *mineral* combination of water and iron is owing to this medium,

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of the calcarious and metallic earths. Phlogiston alone, in the hands of nature, is capable, when fitly conjoined with terrene bodies, to make them unite with water; but where the proportion is insufficient to this end, the addition of acids must, in many cases, be added to work the effect, and produce an absolute incorporation of them. In the instance of iron, it is particularly *clear*, from many experiments I have made, that there are no *human* means, but the application of an *acid*, nor any *natural* medium, but the presence of an acid, or of pure phlogiston in a larger proportion, by which iron can be intimately combined with water,

yet can we not effect the same by any means of art; because we cannot procure the phlogistic *gas* in that *state of purity*, which is necessary to this end: that subtle body being so active and volatile *, when in a greater degree separated from others, as not to suffer itself to be confined, but either pervading their junctures or bursting the vessels in which we would collect it, to elude continually our most diligent attempts. And it is therefore impracticable to make a composition of water and iron, resembling in this point of specific gravity to the *native* Chalybeat waters; since when acids are employed, the fluid will always be found, instead of lighter, to be heavier than common water, in proportion to the impregnation.

The only method therefore of making an artificial Chalybeat water, is by forming in it a *salt* of steel, by the addition of iron and some acid, or by making a dilute solution of some such salt already formed; and by this means a composition may be produced, which, in its sensible qualities, nearly resembles the native Chalybeat waters; and will also stand the test of some general trials, without disclosing any variation from them; but under the question of stricter experiments confesses a very different nature, and that in points, which also prove its medicinal efficacy to be far inferior. But to set this matter in the clearest light, and shew distinctly the variation betwixt the two kinds, let us search into the true nature of a Chalbeat water thus formed, by the same methods of examination, we before applied to those of the proper native kind.

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* We see from the fact above-mentioned, the phlogiston is so extremely volatile, in that state, in which it unites iron and the aqueous fluid, that if Chalybeat waters, when taken out of the well, be not extremely well confined, this active body quits the fluid, and flying off lets the iron immediately disjoin from the water, and fall to the bottom of the containing vessel.

To form an *artificial* Chalybeat water, the nearest resembling the water of the *Islington* spring, dissolve six grains of salt of steel in a pint of spring water; let the solution settle, and pour off the clear part from the sediment, or pass the whole fluid through a paper filter.

The taste of this water will be the same with that of the *Islington* water, excepting an austerity or roughness, which, with some, gives a degree of that sensation called setting the teeth on edge.—Being mixt with brandy, or infusion of galls, green tea, &c. it will, like the other, convert them to blackness: and so far the two kinds agree with each other. But weighed in the manner above described, this fictitious Chalybeat water will be found heavier than common water, by three grains in 3840, and consequently than that of the *Islington* spring, by about sixteen.—Being reduced to a small quantity, by evaporation, the salt will again shoot in small crystals; or if it be forced by heat to perfect dryness, a white mass will remain: either of which, being put into a fresh quantity of water, will dissolve again, and become similar in all respects to the first.—Being left open to the air, it will yet retain the iron, and continue unchanged in taste, &c.—Being commixt with a solution of alkaline salts, an effervescence will immediately appear, and the mixture will become turbid with a green foulness, that will by degrees subside; and the clear part of the fluid being poured off, will be found to be totally deprived of the iron.—Being added to a solution of sope, a coagulum will follow, and the iron conjoined with the oleaginous part of the sope, will float on the surface of the fluid.—Being commixt with animal bile, or urine, a turbidness immediately succeeds, from a precipitation of the iron; but no change of colour is caused, unless when the bile or urine used are in a putrid state, and then a green or black foulness immediately ensues.

From hence it appears, that a fictitious Chalybeat water may be compounded, which corresponds with the *Islington* and other *native* Chalybeat water in its sensible quali-

qualities; and also in that property, which shews itself in the experiment made with brandy, infusion of galls, &c. and established as the common test of Chalybeat waters; but in the investigation of its obscurer qualities, by a comparison of its specific gravity, or by a nicer analization, either by heat or the separating power of substances added, displays such as are most palpably different. The *Islington*, and other *native* mineral Chalybeat waters of the *simple* or true kind, are we see lighter than common water; but this *artificial* one necessarily heavier. In the first, the iron, being united with the aqueous fluid by the phlogistic gas, which when not combined with an acid and rendered a fixt sulphur, is the most volatile body in nature, flies off during the evaporation of the water, or on its being left open to the air, and leaves the iron in its primary and insoluble state; but to all other methods of analization such water resists. In the other, on the contrary, the union being caused by an acid, which has combined with the iron, a saline body is formed; and the fluid being dissipated by heat, leaves behind it not only the iron, but that which is necessary as a medium to its conjoining with water; nor does any separation follow, if this fictitious water be exposed to the open air: but being tried by the addition of the more powerful alkalies, such as a solution of lixivate salts, bile, urine, &c. the iron is deprived of the acid, and an analysis is made, which soon shews itself, by the ebullition of the fluid, and the precipitation of the iron.

It is therefore absolutely certain, that there are the clearest marks of a specific difference, betwixt the *Islington* water, and any formed by the *artificial* means I have here proposed, that could be required to convince the most sceptical; and by consequence, equally certain, that the *Islington* water is *not* so formed; nor therefore fictitious, unless compounded on other principles: and that no other method of conjoining iron and water has been hitherto made known to the world, I appeal to those who are most versed in matters of this kind; and could, were it
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consistent with the compass of this treatise, easily enforce the arguments already produced on this behalf, so as to convince to any one whose acquaintance with the subject would render me intelligible, that it is highly improbable there ever will. But it certainly suffices to the destroying so groundless a falsity, as that respecting the sophistication of the *Islington* waters, to have shewn that it agrees, on the strictest experimental examination, in all its qualities, with those of the *Spa* and *Tunbridge*; and even possesses in a highly superior degree, *that* which is the most distinguishing characteristic of the true kind of *native* Chalybeate waters. I may add indeed one reason, to overthrow this malicious fiction; perhaps of a more popular kind than those I have already advanced: I mean, the absurdity of supposing, that a well, which discharges at least 888 gallons every day, should be supplied by any artifice with the necessary ingredients, in such manner as to affect its water, so as to make it at all times correspond in its qualities, under the severest trials, with the mineral waters of the *Spa* and *Tunbridge*, or any other that flow spontaneously from the earth. And this consideration may, perhaps, seem to have been alone sufficient, to have superseded the necessity of all I have said before in proof of the genuineness of this water. But ignorance, the common mother of errors, frequently makes a complication of them support each other against every effort of reason, till the whole body be overcome: and in the present instance she had prompted some, who embraced the mistake of this water's being medicated by art, to remove that sense of the natural impossibility, which loaded their belief of the fact, when they reflected on the copiousness of the effusion this well continually makes, by supposing a great quantity of iron has been deposited in the recesses of the stream, and unites itself with the water as that flows over it. A notion not less preposterous, when the nature of the subject is in the least understood, than that for which it is brought to account; but feasible enough to those who
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are totally unacquainted with every thing of the kind. And it was therefore necessary, in order to banish effectually this delusive imagination, and preclude the intrusion of the like for the future, to show, that Chalybeat waters cannot be formed by any such simple means; nor at all in any such manner, as that they will, on accurate inspection, be found to agree in their essential qualities, with that of this spring, or others which are compounded by the hand of nature.

Having thus I hope fully proved by clear experimental evidence, that the water of the *Islington* spring is of the true *native* Chalybeat kind, by manifesting the essential difference betwixt this kind and the fictitious; it may not perhaps be impertinent, in order to render this little treatise more effectually conducive to the purposes for which it is intended, to show, that this difference extends to their *medicinal nature*; and that the first are not only preferable, as a far more efficacious remedy, to the latter, but likewise to all other *artificial* preparations and forms in which steel can be exhibited. To this end, it must be premised, that no substance whatever when taken, can be carried into the habit, or act otherwise than on the intestines, unless the same be in a fluid state. In order that solid bodies should enter into the sanguinary system, or commix with the mass of blood, it is absolutely necessary they should first become a proper part of the chyle; of which, by its totally percolating through the finest filter, it appears, that no undissolved bodies ever constitute a part. The solution of solid bodies, which fits them to assimilate with the chyle, may be either prior to their being taken, or performed in the intestines, by some of the various juices that are provided to elaborate the digestion. But we have before observed, that steel is insoluble by any means of art, except the application of acids; and on trying it with bile, the pancreatic juice, or any other humours generated in animal bodies, except the accidental accessence of food in the stomach, it will be found equally to resist them. It is therefore obviously requisite,

site, in order to make steel capable, by artificial means, of passing further than the *via prima*, that an acid should be employed, and the steel converted to a fluid state; and accordingly, the preparations of it, which practice has adopted, are either the vitriolic salt of steel;—solutions formed by the use of the spirits of nitre or sea salt;—corrosions made by the addition of *vinegar*, *tartar*, &c.—infusions in wine, or some such parallel methods, in which lies all that art at present can pretend to. But the best of these is far from being a performance adequate to the intention; for though steel may be thereby rendered capable of being dissolved in water; while preserved from the action of other bodies; yet is this union not proof against the analyzing power of the bile, but on the commixture of such solution with it in the bowels, the steel is, for the most part, precipitated, and again rendered unfit to pass the lacteals, and be carried by the chyle into the mass of blood: especially, if from the concomitant circumstances of diet, the juices of the *intestines* are disposed to a greater alkalescence. In the native Chalybeat water, on the contrary, this defect in no degree subsists; for neither the resolving power of bile, or the action of any other humour in the body, are able to destroy, in the least, the combination of the iron and the water; but remaining still as one homogeneous fluid, the whole commixes perfectly with the chyle, and is carried into the blood without that uncertain diminution or total privation of the iron, to which the *fictitious* Chalybeat water is subject. The consequence of this difference, is apparent in the visibly superior efficacy, which half a pint of the *Islington* water, containing only two grains of iron, has over a dose of three grains of salt of steel: and, as well as the theoretic reason I have been alledging, proves it to be greatly preferable to any *artificial* preparation of steel whatever.

It may possibly be expected, I should here give some account of the medicinal virtues of the *Issington* water; but as the use of steel as a remedy is at present well understood; and as I have already set forth in what the expedience or advantages of natural Chalybeat waters consist, beyond any other form in which it can be administered, I think it unnecessary to expatiate largely on this head. I shall, however, for the benefit of those, who may not be able to obtain the advice of regular physicians on every occasion, in a briefer manner enumerate the cases, in which they may reasonably hope for relief from drinking it.

In the first place, it is of the greatest efficacy in all nervous diseases, whether in palsies or fits of every kind, or the numerous train of hypochondriac and hysterical complaints, commonly called *vapours*: and in this intention it reaches all asthmatic complaints, not proceeding from ulcerated lungs or fluxions on the glands:—the incipient *gutta serena**, and all dimness of sight, not arising from an inflammation, a turbidness of the humours of the eye or of the cornea, or the decline of years;—all deafness not caused by obstructions of the passages, or by old age;—as also to that general debility or muscular weakness, as well as decay of appetite and failure of digestion, which are frequently caused by the want of

* The incipient *gutta serena*, with all those kinds of deafness that arise from nervous causes, ought undoubtedly to be considered and treated as paralytic diseases of the respective organs.

† Both the deobstruent and corroborative qualities of steel, render it a most powerful remedy against all nervous complaints, whether of the paralytic, or hypochondriac and hysterical classes,

of purer air and due exercise †. Nor is it of less avail in that impaired state of the habit, which is consequent to the violence of acute diseases; but will be found in these cases, the quickest restorative of the due animal strength, and just tune of the solids that medicine can furnish.

It may be esteemed a specific in all menstrual obstructions, whether of the first eruption in girls arrived at a mature age, or of the regular returns in adult women; and in all those various disorders that proceed from this cause, as well such as shew themselves under those appearances vulgarly called the *green-sickness* *, as the others, which manifest themselves in a variety of symptoms; as acute head-achs; pains of the womb; violent coughs; loss of appetite; waste of strength and flesh; slow irregular fevers; hysteric fits; swellings of the legs; inflammatory swellings in various parts of the body; breakings out; obstinate sores †; and sometimes gatherings of matter in the lungs.

In dropries also, when taken together with the *sal* †
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classes, or, in short, in any kind either of morbid relaxation, or convulsive affections.

* The common symptoms of chloretic cases are so universally known, that it is needless to give any hints for distinguishing them.

† In other pulmonic consumptions, perhaps the use of steel may be liable to objections; as tending to encourage a hydrop-
tufis; but in the *nux vomica*, produced by a suppression of the catamenia, there is no possibility of a cure, except by removing the cause: and all other emmenagogues are equally liable to the same objection.

‡ The *sal polychrest* and tartar vitriolate, when properly prepared, are in reality the same salt. But what is at present
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polychrest, or *tartar vitriolate*, it will be found of greater avail than any other remedies now in practice; as the benefit received from such a method, is more durable than that which is obtained by the use of mercurial or antimonial preparations, or violent drastic purges: the one operating to a radical cure, by reforming the vitiated state of the secretions, particularly of the urinary glands, and restoring the depraved tone of the solids*; while the other generally proves only *palliative*, by evacuating the present collections of the water, and leaving the habit, weakened by the operation, more disposed to a return of the same disorder.

It is of signal use also, as a powerful deobstruent, in the cure of the scrophula or king's evil, and other glan-

sold under the name of the tartar vitriolate, contains a large quantity of unneutralized oil of vitriol: an abuse which has been occasioned by the chemists selling, for this salt, the residuum after the distillation of aqua fortis, powdered, without any other preparation: and this has made the redundancy of the acid become regarded as a necessary quality of this medicine. As this circumstance, nevertheless, makes it very unfit to be used in the present intention, it is much better to ask with the apothecaries or chemists for the sal polychrest; which being prepared in a crystalline form, is certain to be duly neutralized.

* It may perhaps be urged, that the drinking the compound mineral waters, which are impregnate both with steel and a cathartic salt, appears to be equally apposite to this intention; as both the corroborative and evacuative purposes may be answered by it: but there are valid reasons on which I ground my preference of the other method. The first is, in order to produce the purgative effect, a large quantity of the compound mineral water must be taken; which, as I before observed, is in some degree an inconvenience in all cases, but in this kind, of the highest; as the load water may be very detrimental

glandular obstructions, and the scorbutic, and other disorders springing from them; especially, if taken along with alkaline salts, to attenuate and dissolve the coagulated and viscid humours: and by this course, I make no doubt, but many of those cases, which fail of aid from the violent operation of mercury and antimony, and are given up to the mangling offices of the knife and caustic, might find effectual relief.

Considerable benefit may be also had from them, assisted by gentle evacuants, in that unhappy state of the habit, which disposes people to grow fat, and be subject to lethargic affections, and sometimes apoplectic fits.

To conclude, I shall add a few remarks on the best manner of taking these waters, either in general, or in those particular cases, that require a peculiar management: and this is the more expedient, as an error in that point has been one principal cause of their falling into disrepute: it having been the common practice to take double or treble the quantity proper for a dose. This has been probably occasioned, by concluding it requisite to take the same proportion of this water, as is found to be necessary of those of the purgative kind, in order to their producing the intended effect; and the mistake has been frequently the occasion of their giving slight head-achs, and sometimes a dizziness or sickness, to such as were not accustomed to drink them. But when the manner is more judiciously regulated, these inconveniencies may

trimental, and even sometimes immediately dangerous; whereas this is avoided, if the purging salts be dissolved in a *simple* Chalybeat water, whereof only a very moderate portion is necessary: the other is, that the vitriolate tartar is much more diuretic than the salts of these waters, or indeed any others which have cathartic effects; and therefore much fitter to be joined as a hydrogogue with the steel in these cases.

may be intirely avoided; and even a sensible benefit and relief obtained from them at the first taking.

The dose in general, ought to be one half pint glass, for the first three or four times; and increased gradually from that to double the quantity; but if this produce any disagreeable symptoms, it should be diminished, till they cease to follow: for it may be taken as an infallible rule, that a less proportion, than will continually excite a present disorder, will be sufficient to work all the good effects on the habit, which may be expected from this kind of remedy. But when taken with purgative salts, they may be dissolved in half a pint of the water, and twice as much may be gradually drunk, after the salts begin to operate: for the quantity of water may with safety be increased, in such cases, to this degree; as the quick evacuation of it prevents the inconveniencies resulting from the surcharge that ought otherwise to be avoided. In dropical habits, however, it is proper at all times to confine the quantity to a pint, or less.



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